

REMARKS

Applicant has studied the Office Action dated September 11, 2002 and has made amendments to the claims. It is submitted that the application, as amended, is in condition for allowance. By virtue of this amendment, claims 2-25 are pending. Claim 1 has been canceled without prejudice. Claims 2-6, 8, 14, 16, and 20 have been amended, and new claim 25 has been added. Reconsideration and allowance of the pending claims in view of the above amendments and the following remarks are respectfully requested.

The disclosure was objected to because of "informalities". The Examiner asserted that the use of the term "local context metric" in the specification was outside of its ordinary meaning because the accepted meaning of "metric" deals with the metric measurement system. This position of the Examiner is respectfully traversed. While the Examiner is correct that one ordinary use of the word "metric" is as part of the title of the "metric system", this is not the only ordinary meaning of the word.

As shown in the Attachment, another ordinary meaning of the word "metric" is "a standard of measurement". Merriam-Webster Online Dictionary (<http://www.m-w.com/>, Merriam-Webster, Inc., 2002). The word "metric" is meant to have this meaning in the specification of the present invention. More specifically, in embodiments of the present invention, a "local context metric" is a measurement of the type of image content in the local area surrounding a pixel. For example, in one embodiment, the "local context metric" is a local content measurement made using a contrast function that calculates the difference between the maximum and minimum pixel values (i.e., contrast) over a 3×3 grid in the relevant area of the source image. In other words, nearby source image pixels are used to calculate a "local context metric" whose value can identify whether the local image content is text or graphics. Thus, Applicant respectfully submits that the term "local context metric" has one of its ordinary meanings in the specification, and the objection to the disclosure should be withdrawn.

Claims 1-24 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner asserted that the use of the term "local context metric" in the claims was repugnant to the usual meaning of that term because the accepted meaning of "metric" deals with the metric measurement system. This position of the Examiner is respectfully traversed.

As explained above, one ordinary meaning of the word "metric" is "a standard of measurement". Merriam-Webster Online Dictionary (<http://www.m-w.com/>, Merriam-Webster, Inc., 2002). The word "metric" is meant to have this meaning in the specification of the present invention. More specifically, in embodiments of the present invention, a "local context metric" is a measurement of the type of image content in the local area surrounding a pixel. Thus, Applicant respectfully submits that the term "local context metric" is not given a meaning in the claims that is repugnant to its usual meaning. Accordingly, it is respectfully submitted that the rejection of claims 1-24 under 35 U.S.C. § 112, second paragraph, should be withdrawn.

Claims 1, 2, 5, 6, 8, 9, 12, 14, 15, 18, 20, and 21 were rejected under 35 U.S.C. § 102(e) as being anticipated by Miyake (U.S. Patent No. 6,088,489). Claims 1, 2, 6, 8, 9, 12, 14, 15, 18, 20, 21, and 24 were rejected under 35 U.S.C. § 102(e) as being anticipated by Lin (U.S. Patent No. 6,044,178). Claims 3, 4, 7, 10, 11, 13, 16, 17, 19, 22 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyake. Claim 1 has been canceled so, with respect to this claim, these rejections are moot. With respect to claims 2-24, these rejections are respectfully traversed.

The present invention is directed to methods and devices for scaling an image from one resolution to another in which the convolution kernel to be applied is selected based on local image content. One preferred embodiment of the present invention provides a method for scaling a source image to produce a scaled destination image. According to the method, a local context metric is calculated from a local portion of the source image, and a convolution kernel is generated from a plurality of available convolution kernels based on the calculated local context

metric. The generated convolution kernel is used to generate at least one pixel of the scaled destination image, which has a different resolution than the source image. The available convolution kernels include at least one smoothing kernel and at least one sharpening kernel. Because the pixels of the scaled image are generated by selectively sharpening or smoothing the source image depending on the calculated local context metric, the scaling process generates a high quality scaled image.

As recognized by the Examiner, the Lin reference fails to disclose an image scaling method in which at least two convolution kernels are stored in a memory, and either one of the stored convolution kernels is selected or another convolution kernel is generated by interpolating the stored convolution kernels. The embodiment of the present invention recited in amended claim 4 includes such features. As also recognized by the Examiner, the Lin reference also fails to disclose an image scaling method or device in which the available convolution kernels include at least one smoothing kernel and at least one sharpening kernel. The embodiments of the present invention recited in amended claims 5, 8, 14, and 20 include such a feature. As further recognized by the Examiner, the Lin reference also fails to disclose an image scaling device that includes a kernel generator that stores all available convolution kernels and selects one of the stored convolution kernels as the current convolution kernel based on a calculated local context metric. The embodiment of the present invention recited in amended claim 16 includes such features. Therefore, amended claims 4, 5, 8, 14, 16, and 20 distinguish over the Lin reference.

Furthermore, the Miyake reference discloses an image processing system for communicating between devices having different resolutions. However, Miyake does not disclose a method for scaling a source image to produce a scaled destination image in which a generated convolution kernel is used to generate at least one pixel of the scaled destination image, which has a different resolution than the source image, as is recited in amended claim 4. Amended claims 5 and 8 contain similar recitations. Similarly, Miyake does not disclose an image scaling device for receiving pixels of a source image and outputting pixels of a scaled destination image that includes a scaler that receives coefficients of a current convolution kernel from a kernel generator and uses the coefficients to generate at least one pixel of the scaled destination image from pixels of the source image, with the scaled destination image having a

different resolution than the source image, as is recited in amended claim 14. Amended claims 16 and 20 contain similar recitations.

The image processing system of Miyake is directed to a system in which a source image from a first device is transmitted to a second device that requires an image with a different resolution. As shown in Figures 6 and 7, the source image 101 of the transmitting device is smoothed 102 and then compressed 103, and the resulting image is transmitted to the receiving device. The receiving device decompresses 104, then interpolates 105, and then corrects 106 the transmitted image to produce a final image with the resolution required by the receiving device. Figure 11 of Miyake shows one embodiment of the transmitting device in which a filter selection unit 301 selects one smoothing filter 302 from a group of filters for use by the smoother 202.

While Miyake does disclose selecting one filter from a filter group, in the image processing system of Miyake the selected filter is merely used by the smoother to produce a smoothed image that has the same resolution as the source image. More specifically, the source image 101 is input to the smoother 202 to smooth the image. The smoothed image is then input to a compression circuit 204-208 that compresses the smooth image for transmission. Although the transmitted image has been smoothed and then compressed, it still has the same resolution as the original image. The resolution of the image is not altered until the image reaches the interpolation circuit 105 of the receiving device. Thus, Miyake only discloses selectively choosing filters from a filter group for use in producing a smoothed image having the same resolution as the source image.

In contrast, in embodiments of the present invention, generated convolution kernels are used to generate the pixels of a scaled destination image that has a different resolution than the source image. More specifically, a convolution kernel is generated from a plurality of available convolution kernels based on a local context metric that is calculated from a local portion of the source image. The generated convolution kernel of the available convolution kernels is used to generate at least one pixel of the scaled destination image. This scaled destination image has a different resolution than the source image. Thus, in embodiments of the present invention, the generated convolution kernel is used in producing the scaled destination image with its different resolution. Miyake does not teach or suggest a method or device for scaling a source image to

produce a scaled destination image in which a generated convolution kernel is used to generate at least one pixel of the scaled destination image, which has a different resolution than the source image.

Applicant believes that the differences between Miyake, Lin, and the present invention are clear in amended claims 4, 5, 8, 14, 16, and 20, which set forth various embodiments of the present invention. Therefore, claims 4, 5, 8, 14, 16, and 20 distinguish over the Miyake and Lin references, and the rejections of these claims under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) should be withdrawn.

As discussed above, claims 4, 5, 8, 14, 16, and 20 distinguish over the Miyake and Lin references, and thus, claims 2, 3, 6, and 7, claims 9-13, claims 15, 17-19, and claims 21-24 (which depend from claims 4, 5, 8, 14, 16, and 20) also distinguish over the Miyake and Lin references. Therefore, it is respectfully submitted that the rejections of claims 2-24 under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) should be withdrawn.

Claim 25 has been added by this amendment, and is provided to further define the invention disclosed in the specification. Claim 25 is allowable for at least the reasons set forth above with respect to claims 2-24.

Applicant has examined the references cited by the Examiner as pertinent but not relied upon. It is believed that these references neither disclose nor make obvious the invention recited in the present claims. In view of the foregoing, it is respectfully submitted that the application and the claims are in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is invited to call the undersigned attorney at (561) 989-9811 should the Examiner believe a telephone interview would advance the prosecution of the application.

Respectfully submitted,

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APPENDIX

IN THE CLAIMS:

2. (Amended) The method as defined in claim [1] 4, further comprising the step of repeating the calculating, generating, and using steps for each pixel in the scaled destination image.

3. (Amended) The method as defined in claim [1] 5, further comprising the step of: storing all available convolution kernels in a memory, wherein in the generating step, one of the stored convolution kernels is selected based on the calculated local context metric.

4. (Amended) [The] A method [as defined in claim 1, further] for scaling a source image to produce a scaled destination image, said method comprising the [step] steps of:
calculating a local context metric from a local portion of the source image;
generating a convolution kernel from a plurality of available convolution kernels based on the calculated local context metric;
using the generated convolution kernel to generate at least one pixel of the scaled destination image, the scaled destination image having a different resolution than the source image; and
storing at least two convolution kernels in a memory, wherein in the generating step, either one of the stored convolution kernels is selected or another convolution kernel is generated by interpolating the stored convolution kernels.

5. (Amended) [The] A method [as defined in claim 1,] for scaling a source image to produce a scaled destination image, said method comprising the steps of:
calculating a local context metric from a local portion of the source image;
generating a convolution kernel from a plurality of available convolution kernels based on the calculated local context metric; and
using the generated convolution kernel to generate at least one pixel of the scaled destination image, the scaled destination image having a different resolution than the source image,

wherein the available convolution kernels include at least one smoothing kernel and at least one sharpening kernel.

6. (Amended) The method as defined in claim [1] 5, wherein the local context metric has more than two possible values.

8. (Amended) A machine-readable medium encoded with a program for scaling a source image to produce a scaled destination image, said program containing instructions for performing the steps of:

calculating a local context metric from a local portion of the source image;
generating a convolution kernel from a plurality of available convolution kernels based on the calculated local context metric; and
using the generated convolution kernel to generate at least one pixel [in] of the scaled destination image, the scaled destination image having a different resolution than the source image,
wherein the available convolution kernels include at least one smoothing kernel and at least one sharpening kernel.

14. (Amended) An image scaling device that receives pixels of a source image and outputs pixels of a scaled destination image, said image scaling device comprising:

a context sensor for calculating a local context metric based on local source image pixels;

a kernel generator coupled to the context sensor, the kernel generator generating a current convolution kernel from a plurality of available convolution kernels based on the local context metric calculated by the context sensor; and

a scaler coupled to the kernel generator, the scaler receiving the coefficients of the current convolution kernel from the kernel generator, and using the coefficients to generate at least one pixel of the scaled destination image from pixels of the source image, the scaled destination image having a different resolution than the source image,

wherein the available convolution kernels include at least one smoothing kernel and at least one sharpening kernel.

16. (Amended) [The] An image scaling device [as defined in claim 14,] that receives pixels of a source image and outputs pixels of a scaled destination image, said image scaling device comprising:

a context sensor for calculating a local context metric based on local source image pixels;

a kernel generator coupled to the context sensor, the kernel generator generating a current convolution kernel from a plurality of available convolution kernels based on the local context metric calculated by the context sensor; and

a scaler coupled to the kernel generator, the scaler receiving the coefficients of the current convolution kernel from the kernel generator, and using the coefficients to generate at least one pixel of the scaled destination image from pixels of the source image, the scaled destination image having a different resolution than the source image.

wherein the kernel generator stores all available convolution kernels, and

the kernel generator selects one of the stored convolution kernels as the current convolution kernel based on the calculated local context metric.

20. (Amended) A display device that receives source image pixels and displays a scaled destination image, said display device comprising:

a context sensor for calculating a local context metric based on local source image pixels;

a kernel generator coupled to the context sensor, the kernel generator generating a current convolution kernel from a plurality of available convolution kernels based on the local context metric calculated by the context sensor;

a scaler coupled to the kernel generator, the scaler receiving the coefficients of the current convolution kernel from the kernel generator, the scaler using the coefficients to generate at least one pixel of the scaled destination image from pixels of the source image, the scaled destination image having a different resolution than the source image; and

a display for displaying the scaled destination image,

wherein the available convolution kernels include at least one smoothing kernel and at least one sharpening kernel.



Attachment

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7 entries found for **metric**.

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 metrical
 -metric
 metric space
 metric system

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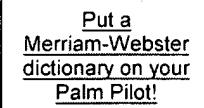
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metric [Find](#)

Main Entry: **1met·ric**

Pronunciation: 'me-trik'

Function: *noun*Etymology: Greek *metrikē*, from feminine of *metrikos* in meter, by measure, from *metron* measure -- more at [MEASURE](#)

Date: 1760

1 *plural* : a part of prosody that deals with metrical structure2 : a standard of measurement <no *metric* exists that can be applied directly to happiness -- *Scientific Monthly*>

3 : a mathematical function that associates with each pair of elements of a set a real nonnegative number with the general properties of distance such that the number is zero only if the two elements are identical, the number is the same regardless of the order in which the two elements are taken, and the number associated with one pair of elements plus that associated with one member of the pair and a third element is equal to or greater than the number associated with the other member of the pair and the third element

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|--------------------------|----------------------|----------------------|
| \&\ as a and u in about | \e\ as e in bet | \o\ as aw in law |
| \&\ as e in kitten | \E\ as ea in easy | \oi\ as oy in boy |
| \&r\ as ur/er in further | \g\ as g in go | \th\ as th in thin |
| \a\ as a in ash | \i\ as i in hit | \[th]\ as th in the |
| \A\ as a in ace | \I\ as i in ice | \u\ as oo in loot |
| \ä\ as o in mop | \j\ as j in job | \u\ as oo in foot |
| \au\ as ou in out | \[ng]\ as ng in sing | \y\ as y in yet |
| \ch\ as ch in chin | \O\ as o in go | \zh\ as si in vision |

For more information see the [Guide To Pronunciation](#).

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